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Production of Pycnidia by Macrophomina phaseolina

by

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PRODUCTION OF PYCNIDIA BY *MACROPHOMINA PHASEOLINA*

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Macrophomina phaseolina (Tassi) Goid., syn. *M. phaseoli* (Maub.) Ashby, the charcoal-rot fungus, is a pathogen of world-wide importance attacking many hosts. Although pycnidia of this fungus have been observed on many hosts (Hildebrand, Miller & Kock, 1945; Moniz, Thirumalachar & Patel, 1956; Kulkarni, Patil & Sulaiman, 1962; Mathur, 1967; Kulkarni & Patil, 1968), they are not produced in ordinary media. The fungus may, however, sporulate when plated on special media (Post, 1933; Luttrell, 1946; Ashworth, 1959; Ostazeski, 1964; Goth & Ostazeski, 1965; Knox-Davies, 1965, 1966; Kulkarni & Patil, 1968). In 1971 it was shown by Srinivasan, Chidambaram, Mathur & Neergaard that many seed-borne fungi which lose the ability to sporulate in ordinary agar media, sporulate profusely on water–agar–leaf media. Many non-sporulating isolates of *M. phaseolina* obtained from different sources were there-

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Table 1. *Production of pycnidia in different isolates of* Macrophomina phaseolina *on water–agar–leaf medium under alternating cycles of near-ultraviolet light and darkness*

Host	Origin	Year of first isolation	Incubation period within which pycnidia had formed (days)	
			Wheat	Pearl millet
Carica papaya	Rhodesia	1954	3	3
Cassia angustifolia	Egypt	1970	2	2
C. senna	Egypt	1967	7	7
C. senna	Egypt	1967	7	7
Hibiscus esculentus (seed)	India	1970	3	3
Gossypium sp.	U.S.A.	1954	5	7
Gossypium sp. (stem)	U.S.A.	1957	7	7
Gossypium sp. (seedlings)	Sudan	1954	5	7
Glycine max (seed)	India	1968	3	3
Luffa acutangula (seed)	India	1968	3	3
Nicotiana tabacum (leaf)	Tanzania	1961	7	7
Phaseolus aureus (seed)	India	1970	3	3
P. mungo (seed)	India	1970	3	3
P. vulgaris (seed)	India	1969	3	3
Sesamum indicum (seed)	India	1970	2	2
Sorghum sp.	Nigeria	1959	3	3
Sorghum sp. (stem)	U.S.A.	1959	7	7
Tagetes sp. (seed)	India	1969	3	3
Vigna sinensis (seed)	U.S.A.	1956	7	7
V. sinensis (seed)	India	1970	3	3

fore tested on this medium for pycnidial production and the results are presented here.

Fifty-eight isolates of *Macrophomina phaseolina* (10 from this Institute, 10 from Canada, 16 from the Netherlands, 8 each from England and India, 3 each from Egypt and Japan) were used in this study.

Cultures were first grown on potato dextrose agar at 20°. Mycelial disks from cultures 48 h old were transferred to autoclaved leaf bits (2–3 cm long) of pearl millet and wheat placed on 1·5 % water–agar in plastic Petri dishes as described by Srinivasan *et al.* (1971). Plates were incubated in either darkness, near-ultraviolet light or artificial daylight. Darkness was achieved by wrapping plates in black paper. Near ultraviolet light was provided by two Philips black light tubes TL 40W/08 while artificial daylight by two Philips white cool fluorescent tubes TLF 40W/34, 12 h each day. The light tubes were horizontally in pairs, 20 cm apart, and 40 cm from the lids of the plates. Observations were recorded by stereoscopic microscope after 2, 3, 5, 7 and 15 days, and compared with respective isolates on PDA under similar incubation conditions of light and darkness. For pycnidial production all the 58 isolates were studied under near-ultraviolet light while artificial daylight was tested only with two selected isolates.

In addition to pearl millet and wheat, production of pycnidia in six

isolates was also studied on leaves of barley, oats and sorghum under near ultraviolet light.

Nearly all the isolates produced abundant mycelium and sclerotia on PDA (Pl. 11, fig. 1). On water–agar–leaf medium all isolates produced scanty, creeping mycelium and sclerotia on both the leaf surfaces and agar, but only 20 isolates produced pycnidia (Table 1; Pl. 11, fig. 2). Leaves of barley, wheat and oats appeared better substrates for pycnidial production than those of pearl millet and sorghum in comparative tests using six isolates.

The two isolates of *Macrophomina* from okra (*Hibiscus esculentus*) and bean (*Phaseolus vulgaris*) produced many more pycnidia than sclerotia under near ultraviolet light (Pl. 11, fig. 3) but in artificial daylight more sclerotia developed (Pl. 11, fig. 4). In darkness only sclerotia developed (Pl. 11, fig. 5).

The water–agar–leaf medium used in this study induced pycnidial production in 20 out of 58 non-sporulating isolates of *Macrophomina phaseolina*. Pycnidium formation was rapid, in some cases within 2–3 days of incubation. Some of the isolates that produced pycnidia were maintained for the past 11–14 years in the sclerotial state on an agar medium. Production of pycnidia was better under near ultraviolet light than the artificial daylight.

The following kindly provided cultures: Professor W. E. Sackston, Canada; Dr S. P. Raychaudhuri, India; Dr A. M. El Zarka, Egypt; the Commonwealth Mycological Institute, England; Centraalbureau voor Schimmelcultures, the Netherlands; and Federation of Culture of Microorganisms, Japan.

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EXPLANATION OF PLATE I I

Macrophomina phaseolina from *Cassia angustifolia*

Fig. 1. On PDA, abundant mycelium with many small sclerotia under near-ultraviolet light.

Fig. 2. Scanty, creeping mycelium, sclerotia (small bodies) as well as pycnidia (large bodies) on water–agar–wheat-leaf medium in near ultraviolet light.

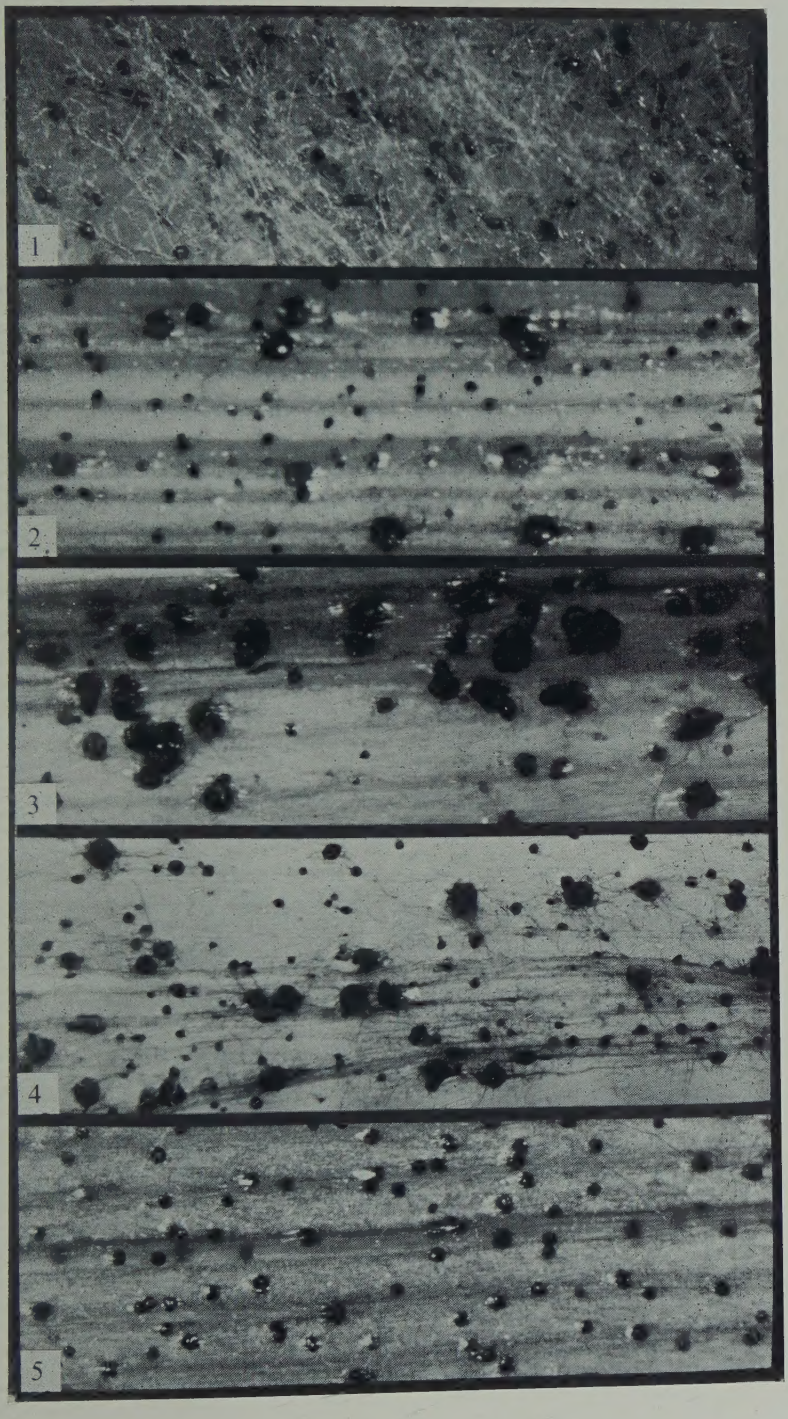
Macrophomina phaseolina from *Hibiscus esculentus* on water–agar–wheat-leaf medium:

Fig. 3. More pycnidia (large bodies) than sclerotia (small bodies) under near ultraviolet light.

Fig. 4. More sclerotia than pycnidia under artificial daylight.

Fig. 5. In darkness, sclerotia only.

All figures × 40.



(*Facing p.* 168)

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